REMARKS/ARGUMENTS

This case has been carefully considered in light of the Office Action dated September 2, 2004, wherein Claims 1, 2 and 11- 14 are rejected under 35 USC 102(b) as being anticipated by Blazejovsky et al. (US 4,600,825); Claims 1, 2 and 11- 14 are rejected under 35 USC 102(b) as being anticipated by Gallione et al. (US 4,228,776); Claims 5, 8 - 10, 15 - 17, 22 - 24, 27 and 31 are rejected under 35 USC 103(a) as being unpatentable over Blazejovsky et al.; Claims 5, 8 - 10, 15 - 17, 22 - 24, 27 and 31 are rejected under 35 USC 103(a) as being unpatentable over Gallione et al.; Claims 1, 2, 4, 7, 8, 11- 14, 22, 25 and 26 are rejected under 35 USC 103(a) as being unpatentable over Dicky et al. (US 5,832,880) in view of Gallione et al.; Claims 1, 2, 5, 8 - 10, 12 - 17, 22 – 24, 27 and 31 are rejected under 35 USC 103(a) as being unpatentable over DeLuca et al. (US 5,870,996) in view of Gallione et al.; Claims 1, 2, 5 – 17 and 19 – 35 are rejected under 35 USC 103(a) as being unpatentable over Ancimer et al. (US 2002/0166515 A1) in view of Gallione et al.; Claims 1, 2, 5, 6, 8, 9, 13 - 16, 19 - 23, 27 – 31 and 34 are rejected under 35 USC 103(a) as being anticipated by Hsu et al. (US 5,365,902) in view of Gallione et al.. No new matter has been added.

Claims 1, 2, 4 -17, 19 – 35 remain pending in this application. Reconsideration in view of the following remarks is respectfully requested.

Rejection under 35 U.S.C. §102

Claims 1, 2 and 11- 14 are rejected under 35 USC 102(b) as being anticipated by Blazejovsky et al. (US 4,600,825). Applicants respectfully traverse this rejection.

Each of the independent Claims 1 and 13 recites, among other features, regulating temperature and pressure of a pre-determined quantity of fuel supplied to a fuel injector. The current version of independent Claim 1 recites that the controlling fuel injection step comprises:

"regulating a temperature of a pre-determined quantity of fuel supplied to said at least one fuel injector;

regulating a pressure of said pre-determined quantity of fuel supplied to said at least one injector".

The current version of independent Claim 13 recites that the compression ignition engine system comprises:

"a fuel injection system comprising at least one fuel injector, said system configured to inject a regulated quantity of temperature regulated, pressure regulated fuel using said at least one fuel injector into said at least one cylinder when said piston is at least one of reciprocating from said TDC toward BDC during an intake stroke and at BDC reciprocating toward TDC during a compression stroke."

Blazejovsky et al. do not teach, suggest or disclose each and every element of Applicants' invention as recited in the current version of the independent Claims 1 and 13. As mentioned above, the current version of the independent Claims 1 and 13 of the Applicants' invention recite regulating temperature and pressure of a predetermined quantity of fuel that is supplied to a fuel injector. On the other hand, Blazejovsky et al. merely disclose a system for conveying fuel, preferably diesel fuel, to an engine, in particular a diesel engine. In that connection, Blazejovsky teaches a heating element provided on a portion of the area of the surface of a filter and in the path of the diesel fuel for partially melting paraffin deposits of the fuel on the heated portion of the filter. "This measure allows a partial heating of the filter surface or another critical spot in the conveying path of the fuel quickly and at low energy expenditure at and following the cold start of the machine at low outside temperatures, so as to eliminate a possible obstacle in the conveying path of the fuel caused by paraffin deposits" (column 1, line 64 to column 2, line 2). On the other hand, the Applicants disclose in the present invention that the temperature of a predetermined quantity of fuel is 'regulated' by controlling the temperature before the fuel is injected into the combustion chamber so that an optimal vaporization is achieved after the fuel injection (line 14, paragraph 16). Heating a surface of the fuel delivery system components to eliminate paraffin deposits as disclosed in Blazejovsky et al. reference is different from regulating a temperature of a predetermined quantity of fuel to achieve optimal vaporization of the fuel as has been disclosed in the Applicants' invention. The temperature needed to keep the paraffin in the fuel in a molten state is one above the melting point of paraffin and as is known in common art, varies over a range of 50 to 60 degrees Celsius. This temperature range is significantly different from the temperature needed for optimal vaporization of fuel in a diesel engine, which is typically above 200 degrees Celsius as is known in common art. Thus, the fuel in the Applicants' invention requires distinctly different degree of heating as compared to the fuel in Blazejovsky et al. reference. Thus, nothing has been mentioned about controlling the temperature of the fuel to bring it to a temperature suitable for optimal vaporization and specifically about controlling the temperature before the fuel is injected into the combustion chamber.

Moreover, Blazejovsky et al. do not disclose any method or system for "regulating pressure of a predetermined quantity of fuel that is supplied to a fuel injector". All that Blazejovsky et al. disclose is a number of pressure sensors installed in the fuel line so that the

heating elements can be controlled among other ways "by means of the pressure difference in the path of the fuel upstream and downstream of the main filter" (column 3, line 59 to line 60) or "by means of metering the absolute pressure in the path of the fuel downstream of the main filter" (column 3, line 61 to line 62). This is different from "regulating a pressure of a predetermined quantity of fuel" as has been disclosed in the Applicants' invention. The Applicants disclose in the present invention that the pressure of a predetermined quantity of fuel is 'regulated' by controlling the pressure at which the fuel is injected into the combustion chamber so that an optimal vaporization is achieved after the fuel injection (line 14, paragraph 16). On the contrary, the pressure difference as disclosed in the Blazejovsky et al. reference is the inherent pressure drop created by the operating conditions to cause the fuel flow in the fuel line. Moreover, the pressure difference is merely measured using a number of sensors positioned on both sides of fuel filters in order to ascertain whether there is any blockage in any of the fuel filters due to paraffin deposits. Nothing has been mentioned about controlling the pressure of the fuel and specifically about controlling the pressure before the fuel is injected into the combustion chamber. In short, the pressure is regulated in the present application, but is merely measured in the applied prior art. As such, Blazejovsky et al. do not disclose every element of the independent Claims 1 and 13 of the Applicants' invention. Therefore, in the present invention, the current version of the independent Claims 1 and 13 are not anticipated by Blazejovsky et al.

Claims 2 and 11 – 12 depend directly or indirectly from Claim 1 and are therefore similarly not anticipated by Blazejovsky et al.. Applicants respectfully submit that these Claims are allowable by dependency. Claims 14 depend directly or indirectly from Claim 13 and is therefore similarly not anticipated by Blazejovsky et al. and this Claim is allowable by dependency. Withdrawal of the rejection under 35 USC 102(b) of Claims 1, 2 and 11- 14 over Blazejovsky et al. is respectfully solicited.

Claims 1, 2 and 11- 14 are rejected under 35 USC 102(b) as being anticipated by Gallione et al.. Applicants respectfully traverse the rejection of Claims 1, 2 and 11- 14 under 35 USC 102.

Gallione et al. do not teach, suggest or disclose each and every element of Applicants' invention as recited in the current version of the independent Claims 1 and 13. The current versions of independent Claims 1 and 13 of the Applicants' invention recite regulating pressure of a predetermined quantity of fuel. As has been mentioned above, the Applicants disclose in the present invention that the pressure of a predetermined quantity of fuel is 'regulated' by controlling the pressure at which the fuel is injected into the combustion chamber so that an optimal vaporization is achieved after the fuel injection. In stark contrast, Gallione et al. do not disclose any method or system to control the pressure of any fuel. Gallione et al. merely

disclose "a fuel feed system for an internal combustion engine, of the type in which a fuel line from a fuel tank contains a fuel feed pump for supplying fuel under pressure to at least one fuel injection pump operating to inject fuel into the internal combustion engine" (Abstract, line 1 to line 3). Gallione et al. are silent on the question of 'regulating' fuel pressure, as that term is used in the present application and thus there is no teaching or suggestion in this reference that fuel pressure can or should be regulated before the fuel and specifically before the fuel is injected into the combustion chamber. As such, Gallione et al. do not disclose every element of the independent Claims 1 and 13 of the Applicants' invention. Therefore, in the present invention, the current version of the independent Claims 1 and 13 are not anticipated by Gallione et al..

Claims 2 and 11 – 12 depend directly or indirectly from Claim 1 and are therefore similarly not anticipated by Gallione et al.. Applicants respectfully submit that these Claims are allowable by dependency. Claim 14 depends directly from Claim 13 and is therefore similarly not anticipated by Gallione et al. and these Claims are allowable by dependency. Withdrawal of the rejection under 35 USC 102(b) of Claims 1, 2 and 11- 14 over Gallione et al. is respectfully solicited.

Rejection under 35 U.S.C. §103

Claims 5, 8 - 10, 15 - 17, 22 - 24, 27 and 31 are rejected under 35 USC 103(a) as being unpatentable over Blazejovsky et al.. Claims 5, 8 - 10, 15 - 17, 22 - 24, 27 and 31 are rejected under 35 USC 103(a) as being unpatentable over Gallione et al.. Claims 1, 2, 4, 7, 8, 11- 14, 22, 25 and 26 are rejected under 35 USC 103(a) as being unpatentable over Dicky et al. (US 5,832,880) in view of Gallione et al.. Claims 1, 2, 5, 8 - 10, 12 - 17, 22 – 24, 27 and 31 are rejected under 35 USC 103(a) as being unpatentable over DeLuca et al. (US 5,870,996) in view of Gallione et al.. Claims 1, 2, 5 – 17 and 19 – 35 are rejected under 35 USC 103(a) as being unpatentable over Ancimer et al. (US 2002/0166515 A1) in view of Gallione et al.. Claims 1, 2, 5, 6, 8, 9, 13 - 16, 19 - 23, 27 – 31 and 34 are rejected under 35 USC 103(a) as being anticipated by Hsu et al. (US 5,365,902) in view of Gallione et al.. Applicants respectfully traverse the rejection of Claims 1, 2, 4 - 17, 19 – 35 under 35 USC 103.

The current version of the independent Claims 1, 13 of the Applicants' invention have been quoted earlier in connection with the Applicants' response to the 102 rejections. In addition, the current version of independent Claim 27 recites a railroad locomotive with a fuel injection system comprising:

"at least one fuel injector, said system configured to inject a regulated quantity of temperature regulated, pressure regulated fuel using said at least one fuel injector into said

cylinders at a crank angle of between about negative three hundred sixty degrees and about three hundred sixty degrees."

Applicants interpret the Office Action as stating that Blazejovsky et al. teach all elements of the Applicants' invention except "the engine being used in a railroad locomotive, the claimed number of cylinders or the equivalence ratio." However, the Applicants respectfully submit that in addition to this element, Blazejovsky et al. do not teach two other elements of the Applicants' independent Claims 1, 13 and 27 - regulating temperature of a predetermined quantity of fuel and regulating pressure of a predetermined quantity of fuel. As elaborated earlier in connection with the Applicants' response to the section 102 rejections, Blazejovsky et al. merely disclose a system for conveying fuel, preferably diesel fuel, to an engine, in particular a diesel engine. Blazejovsky et al. are silent on the question of 'regulating' fuel temperature and pressure, as that term is used in the instant application and thus there is no teaching or suggestion in this reference that fuel pressure and temperature can or should be regulated before actual combustion begins in the combustion cylinder. Therefore, in the present invention, the independent Claims 1, 13 and 27 are not obvious in view of Blazejovsky et al..

Applicants interpret the Office Action as stating that Gallione et al. teach all elements of the Applicants' invention except "the engine being used in a railroad locomotive, the Claimed number of cylinders or the equivalence ratio". However, the Applicants respectfully submit that in addition to this element, Gallione et al. do not teach one other element of the Applicants' independent Claims 1, 13 and 27: regulating pressure of a predetermined quantity of fuel. As elaborated earlier in connection with the Applicants' response to the section 102 rejections, Gallione et al. merely disclose a fuel feed system for an internal combustion engine. Gallione et al. are silent on the question of regulating fuel pressure, and thus there is no teaching or suggestion in this reference that fuel pressure can or should be regulated before actual combustion begins in the combustion cylinder. As described above, although Gallione mentions supplying fuel at a pressure, an obvious condition required to cause the fuel to flow through the supply system, Gallione is silent on the issue of 'regulating' that pressure, that is, controlling the pressure at which the fuel is injected into the combustion chamber so that an optimal vaporization is achieved after the fuel injection. As such, Gallione et al. do not teach, suggest, or disclose every element of Applicants' invention as recited in independent Claims 1, 13 and 27. Therefore, in the present invention, the independent Claims 1, 13 and 27 are not obvious in view of Gallione et al..

Applicants interpret the Office Action as stating that Dicky et al. do not teach, suggest or disclose fuel temperature regulation and that Gallione et al. teach fuel temperature regulation. However, the Applicants respectfully submit that in addition to this element, Dicky et

al. do not teach anywhere another element of the Applicants' independent Claims 1 and 13 - regulating pressure of a predetermined quantity of fuel. As mentioned above, the independent Claims 1 and 13 of the Applicants' invention recite regulating pressure of a predetermined quantity of fuel. On the other hand, Dicky et al. merely disclose a method for control of the start of combustion in a HCCI diesel engine. In that connection, Dicky et al. teach measurement of temperature and pressure of the burning mixture of gas and fuel in the combustion cylinder and the means to incorporate that measurement in the combustion strategy. However, Dicky et al. do not disclose or suggest a pressure-regulating step for the fuel before the fuel is introduced in the combustion cylinder. In stark contrast, the Applicants disclose in the present invention that the pressure of a predetermined quantity of fuel is 'regulated' by controlling the pressure at which the fuel is injected into the combustion chamber so that an optimal vaporization is achieved after the fuel injection. As such, Dicky et al. do not disclose every element of the independent Claims 1 and 13 of the Applicants' invention. Therefore, in the present invention, the independent Claims 1 and 13 are not obvious over Dicky et al.. The Gallione et al. reference is relied upon in the Office Action for teaching fuel temperature regulation, and as such provides no relevant teaching to alleviate the shortcomings of the disclosure of Dicky et al. pertaining to the regulation of pressure. The Applicants' respectfully submit that the present invention, as recited in the independent Claims 1 and 13, is patentable over any one or combination of the Dicky et al. and Gallione et al. references.

Applicants interpret the Office Action as stating that DeLuca et al. do not teach, suggest or disclose fuel temperature regulation and that Gallione et al. teach fuel temperature regulation. However, the Applicants respectfully submit that in addition to this element, DeLuca et al. do not teach anywhere another element of the Applicants' independent Claims 1, 13 and 27 - regulating pressure of a predetermined quantity of fuel. As mentioned above, the independent Claims 1, 13 and 27 of the Applicants' invention recite regulating pressure of a predetermined quantity of fuel. The Applicants disclose in the present invention that the pressure of a predetermined quantity of fuel is 'regulated' by controlling the pressure at which the fuel is injected into the combustion chamber so that an optimal vaporization is achieved after the fuel injection. On the other hand, DeLuca et al. do not disclose or suggest a pressure and temperature regulating method or system for the fuel. DeLuca et al. merely disclose a system comprising diesel fuel injectors and fuel injection pumps of the mechanical spill type. These fuel injection pumps are designed to control maximum combustion pressure and temperature in a combustion chamber by delivering injected fuel at a lower rate during an early part of the injection portion of the pump stroke corresponding to the ignition delay period. Although the feed rate is reduced, the initial injection pressure is maintained at a relatively high level, preferably at a level which is undiminished from that of a system having no provision for lowering the feed rate during the early part of the injection portion of the pump stroke. The fuel injection pumps, as disclosed in

DeLuca et al. reference, are configured only to maintain the initial injection pressure at relatively high levels to facilitate maximum combustion pressure and temperature in a combustion chamber and they do not control the pressure of the fuel in any way. Thus, DeLuca et al. are silent on the question of 'regulating' fuel pressure as that term is used in the present invention and there is no teaching or suggestion in this reference that fuel pressure can or should be regulated before actual combustion begins in the combustion cylinder. As such, DeLuca et al. do not disclose every element of the independent Claims 1, 13 and 27 of the Applicants' invention. Therefore, in the present invention, the current version of the independent Claims 1, 13 and 27 are not obvious over DeLuca et al.. The Gallione et al. reference is relied upon in the Office Action for teaching fuel temperature regulation, and as such provides no relevant teaching to alleviate the shortcomings of the disclosure of DeLuca et al.. The Applicants' respectfully submit that the present invention, as recited in the independent Claims 1, 13 and 27, is patentable over any one or combination of the DeLuca et al. and Gallione et al. references.

The current versions of the independent Claims 1, 13 and 27 of the Applicants' invention have been quoted above. In addition, the current version of independent Claim 34 recites a railroad locomotive comprising:

"a fuel injection system that comprises at least one fuel injector mounted in said at least one cylinder head, said fuel injector comprises a nozzle that is at least partially within said cylinder, said system configured to inject a regulated quantity of temperature regulated, pressure regulated fuel using said at least one fuel injector at a first pre-determined piston position that corresponds to a crank angle of between about negative three hundred sixty degrees and about zero degrees. and inject a second quantity of fuel into said cylinder at a second pre-determined piston position that corresponds to a crank angle of between about negative forty five degrees and about twenty degrees, such that a fuel/air equivalence ratio of the fuel/air mixture in each said cylinder at ignition is between 0.10 and .85."

In addition, current version of independent Claim 35 recites a railroad locomotive comprising:

"a fuel injection system comprising at least one fuel injector mounted in said combustion air inlet plenum, said fuel injector comprising a nozzle, said nozzle at least partially within said combustion air inlet plenum, said system configured to inject a regulated quantity of temperature regulated, pressure regulated fuel using said at least one fuel injector into said cylinders at a crank angle of between about negative three hundred sixty degrees and about three hundred sixty degrees, such that a fuel/air equivalence ratio of a fuel/air mixture in said cylinder at ignition is between 0.10 and .85."

Applicants interpret the Office Action as stating that Ancimer et al. do not teach, suggest or disclose fuel temperature regulation and that Gallione et al. teach fuel temperature regulation. However, the Applicants respectfully submit that in addition to this element, Ancimer et al. do not teach another element of the Applicants' independent Claims 1, 13, 27, 34 and 35: regulating pressure of a predetermined quantity of fuel. As mentioned above, the independent Claims 1, 13, 27, 34 and 35 of the Applicants' invention recite regulating pressure of a predetermined quantity of fuel. The Applicants disclose in the present invention that the pressure of a predetermined quantity of fuel is 'regulated' by controlling the pressure at which the fuel is injected into the combustion chamber so that an optimal vaporization is achieved after the fuel injection. On the other hand, Ancimer et al. do not disclose a pressure and temperature regulating method or system for the fuel. Ancimer et al. merely disclose a combustion strategy for varying loads and speeds and they are silent about the question of regulating the pressure of the fuel. Thus, there is no teaching or suggestion in this reference that fuel pressure can or should be regulated before actual combustion begins in the combustion cylinder. As Ancimer et al. do not disclose every element of the independent Claims 1, 13, 27, 34 and 35 of the Applicants' invention, Applicants respectfully submit that these claims are not obvious over Ancimer et al.. The Gallione et al. reference is relied upon in the Office Action for teaching fuel temperature regulation, and as such provides no relevant teaching to alleviate the shortcomings of the disclosure of Ancimer et al.. The Applicants' respectfully submit that the present invention, as recited in the independent Claims 1, 13, 27, 34 and 35, is patentable over any one or combination of the Ancimer et al. and Gallione et al. references.

Applicants interpret the Office Action as stating that Hsu et al. do not teach, suggest or disclose fuel temperature regulation and that Gallione et al. teach fuel temperature regulation. However, the Applicants respectfully submit that in addition to this element, Hsu et al. do not teach anywhere another element of the Applicants' independent Claims 1, 13, 27 and 34: regulating pressure of a predetermined quantity of fuel. As mentioned above, the independent Claims 1, 13, 27 and 34 of the Applicants' invention recite regulating pressure of a predetermined quantity of fuel. The Applicants disclose in the present invention that the pressure of a predetermined quantity of fuel is 'regulated' by controlling the pressure at which the fuel is injected into the combustion chamber so that an optimal vaporization is achieved after the fuel injection. On the other hand, Hsu et al. do not disclose a pressure and temperature regulating method or system for the fuel. Hsu et al. merely disclose a method for timing of pilot fuel and main fuel injections to combine diffusion combustion and premixed combustion in a dual fuel system. Hsu et al. are silent on the question of regulating fuel pressure and thus there is no teaching or suggestion in this reference that fuel pressure can or should be 'regulated', as that term is used in the present invention, before actual combustion begins in the combustion cylinder. As such, Hsu et al. do not disclose every element of the independent Claims 1, 13, 27 and 34 of

the Applicants' invention. Therefore, in the present invention, independent Claims 1, 13, 27 and 34 are not obvious over Hsu et al.. The Gallione et al. reference is relied upon in the Office Action for teaching fuel temperature regulation, and as such provides no relevant teaching to alleviate the shortcomings of the disclosure of Hsu et al.. The Applicants' respectfully submit that the present invention, as recited in the independent Claims 1, 13, 27 and 34, is patentable over any one or combination of the Hsu et al. and Gallione et al. references.

Each of the remaining rejected dependent Claims 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 30, 31, 32 and 33 depend from an independent Claim which Applicants believe to be in condition for allowance over any one or combination of Blazejovsky et al., Gallione et al., Dicky et al., DeLuca et al., Ancimer et al. and Hsu et al. references for the reasons discussed above with reference to the rejection under 35 USC 102 and 103. More specifically, Claims 2, 4, 5, 6, 7, 8, 9, 10, 11 and 12 depend directly from Claim 1; Claims 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26 depend directly from Claim 13; Claims 28, 29, 30, 31, 32, 33 depend directly from Claim 27. Applicants respectfully submit that Claims 1, 13, 27, 34 and 35 are patentably distinct from the applied references for the reasons discussed above and that Claims 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 30, 31, 32 and 33 are similarly allowable over the applied references based on their dependency. It is respectfully requested that the rejections be withdrawn.

Summary

In view of the foregoing, Applicants respectfully submit that the application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are respectfully requested.

Should the Examiner believe that anything further is needed to place the application in condition for allowance, the Examiner is requested to contact Applicants' undersigned representative at the telephone number below.

Respectfully submitted,

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